

Pacific Walrus (*Odobenus rosmarus divergens*)

Walrus are subdivided into two subspecies: the Atlantic walrus (*O. r. rosmarus*) and the Pacific walrus (*O. r. divergens*). The Pacific walrus is distributed along the continental shelf of the Bering and Chukchi Seas (Fig. 27). In winter, they mostly occur in polynyas and open leads in two major concentrations—one south of St. Lawrence Island and the other in Bristol Bay. In the summer, most follow the retreating pack ice, migrating north into the Chukchi Sea. However, many adult males remain in the Bering Sea to rest and molt at terrestrial haul-out sites.

Because of their large size (they can weigh more than 3,500 lbs.) and prominent tusks, they are one of the most recognizable pinnipeds (Fig. 28). Walrus do not use their tusks to dig for food as is commonly believed. Rather, they use them for fighting and displays of dominance with other walrus, for defense against predators, as picks to pull themselves out of the water onto ice floes, and to kill and tear apart seals.

Pacific walrus can live for up to 40 years. Unlike most pinnipeds, which produce pups every year, walrus produce calves every two to three years. They breed in late winter and usually give birth in mid-May of the following year. Walrus

feed mostly on clams and other benthic invertebrates in shallow waters, usually less than 80 m; however, some have been known to feed on marine mammals such as seals. The species' only non-human predators are polar bears and killer whales, but adult walrus are formidable fighters and do not make easy prey.

The preexploitation population size of the Pacific walrus is estimated at about 200,000 to 250,000 animals. For several thousand years, Native communities have hunted walrus for food, their hides, and their ivory with little or no apparent effect on the population's abundance. Commercial hunting of the Pacific walrus began in earnest in the mid-1800s, causing wide fluctuations in abundance over the next century. Hunting effort was intense in the 1860s and again in the 1930s, with a peak in 1937–1938, when more than 8,000 Pacific walrus were taken in Russia alone. By the 1950s the population was reduced to approximately 50,000 to 100,000 animals. In the 1960s the Soviet Union and the State of Alaska independently established conservation measures to protect the Pacific walrus, and the population subsequently rebounded. From 1975 to 1990 U.S. and Russian scientists conducted joint rangewide aerial surveys every five years to estimate abundance of the Pacific walrus population. The last such survey in 1990 resulted in an estimate of 201,039 animals.

No surveys of Pacific walrus have been conducted since 1990, partly because they are expensive and difficult to coordinate. In addition, past surveys produced population estimates with such wide-ranging confidence intervals that they were of little value for detecting population trends. Given the age and limitations of past surveys, there is no reliable information on current trends in abundance. However, reports from Native hunters and scientists of thin animals and low calf production and survival have led to concerns about the population's status.

The Fish and Wildlife Service is the lead federal agency responsible for conservation of walrus. The Service carries out its walrus conservation program in close cooperation with the Alaska Eskimo Walrus Commission, an organization of Native walrus hunters established in 1978 to help conserve the walrus population, the Alaska Department of Fish and Game, and the U.S. Geo-



Figure 27. Range of the Pacific walrus.



Figure 28. Walrus are easily distinguished from other pinnipeds by their prominent tusks. Their genus name, *Odobenus*, is from the Greek word for tooth. (Photograph by Lloyd Lowry and Kathy Frost.)

logical Survey. They are also aided by university researchers and environmental groups.

In 1994 the Fish and Wildlife Service adopted a Pacific walrus conservation plan to help guide research and management of walrus. As discussed in previous annual reports, the plan was developed following recommendations by the Marine Mammal Commission, the Alaska Eskimo Walrus Commission, and Native communities.

At its 2001 annual meeting in Anchorage, Alaska, the Marine Mammal Commission conducted a comprehensive review of the walrus research and management program. Following that review, the Commission wrote to the Fish and Wildlife Service on 28 December 2001 making recommendations regarding population assessment, harvest monitoring, international cooperation, and co-management activities. The Service replied on 20 March 2002. The details of the recommendations and the Service's responses are described below.

Subsistence Harvest

Walrus are an essential economic and cultural resource for Native communities in Alaska and Russia. They provide food, as well as ivory and hides for Native handicrafts. The annual walrus hunts and handicrafts they support are important for maintaining cultural traditions and as a source of income for Native communities.

The Marine Mammal Protection Act allows the harvest of marine mammals by Alaska Natives for subsistence purposes or for making authentic Native articles of handicrafts and clothing, provided the take is not wasteful. If a marine mammal population is below its optimum sustainable population level, Native takes are subject to regulation by the Fish and Wildlife Service. Because the most recent abundance survey was conducted in 1990, there is no reliable current estimate of population size. As noted, there are some signs that the population may have declined in recent

decades, but in the absence of recent survey data, it is not known if the Pacific walrus population is at or below its optimum sustainable population level or precisely what level of harvest would be safe.

The Service and the walrus commission work together with Native communities to manage the subsistence harvest, collect biological samples from harvested animals, and monitor the walrus population. The subsistence harvest in Alaska is monitored two ways: through ivory tagging and a data collection and biological sampling program. The Fish and Wildlife Service initiated the walrus ivory marking, tagging, and reporting program in 1988 to help monitor the harvest and prevent illegal trade in ivory. It requires that all walrus tusks be tagged within 30 days after a walrus is taken. Because calves, which lack tusks, are also taken, and because compliance with tagging requirements is less than 100 percent in some villages, tagging data do not reflect all walrus that are landed. In the

1960s and 1970s the Alaska Department of Fish and Game carried out a harvest monitoring program that the Service took over in 1980. The program employs people in the four principal walrus hunting villages to record catch data and collect biological samples as hunters return from their hunts. The Service derives its harvest estimates by comparing and extrapolating data from the two programs.

Some walrus sink and are not recovered after they are shot. No current records are kept on the number of walrus struck and lost; however, an analysis of data collected between 1952 and 1972 suggested that 42 percent of walrus shot during the hunt in Alaska were not recovered. Using this ratio as a correction factor results in annual estimates of the number of walrus struck and lost, and therefore the total number of walrus killed in Alaska Native hunts (Table 7). Based on the harvest monitoring program and tusk tagging, the estimated catch level in Alaska for

Table 7. Estimated subsistence harvest and total kills of Pacific walrus in Alaska and Russia, 1992–2001

Year	Alaska		Russia		Total Harvest	Total Removal
	Harvest ¹	Struck/Lost ²	Harvest ³	Struck/Lost ²		
1992	1,857	1,345	1,670	1,209	3,527	6,081
1993	1,493	1,081	856	620	2,349	4,050
1994	1,715	1,242	1,013	734	2,728	4,704
1995	1,729	1,252	1,071	776	2,800	4,828
1996	2,530	1,832	941	681	3,471	5,984
1997	1,798	1,259	731	529	2,469	4,257
1998	1,854	1,343	950 ⁴	688	2,804	4,835
1999	2,837	2,054	1,670 ⁵	1,209	4,507	7,770
2000	2,420	1,752	1,212 ⁶	878	3,632	6,262
2001	1,806	1,308	1,332 ⁷	965	3,138	5,411

¹ Estimates provided by the Fish and Wildlife Service following method described in J. Garlich-Miller and D. M. Burn, 1999, Estimating the harvest of Pacific walrus *Odobenus rosmarus divergens* in Alaska. Fish Bull. 97 (4): 1043–1046.

² Based on a struck/lost ratio of 42 percent cited in F. H. Fay and C. E. Bowlby, 1994, The harvest of Pacific walrus, 1931–1989. Technical Report MMM 94-2. Fish and Wildlife Service, Anchorage, AK. 44 pp.

³ Smirnov, G. P. 1999. Monitoring the Pacific walrus harvest in Russia: History and present time. Pages 29–34 in: Proceedings of a workshop concerning walrus harvest monitoring in Alaska and Chukotka. J. Garlich-Miller and C. Pungowiyi (eds.), Technical Report MMM 99-1. Fish and Wildlife Service, Anchorage, AK. 59 pp.

⁴ Data from Smirnov, G. Chukotka TINRO. Otko, 56, Anadyr, P.O. Box 29, Chukotka, Russia.

⁵ Rinteimit, V., M. Agnakisyak, and G. Smirnov. 2000. Walrus harvest monitoring in Chukotka in 1999. Technical report available from U.S. Fish and Wildlife Service, 1001 East Tudor Road, Anchorage, AK 99503.

⁶ Smirnov, G., V. Rinteimit, and M. Agnakisyak. 2001. Walrus harvest monitoring in Chukotka in 2000. Technical report available from U.S. Fish and Wildlife Service, 1001 East Tudor Road, Anchorage, AK 99503.

⁷ Smirnov, G., V. Rinteimit, and M. Agnakisyak. 2002. Walrus harvest monitoring in Chukotka in 2001. Technical report available from U.S. Fish and Wildlife Service, 1001 East Tudor Road, Anchorage, AK 99503.

2001 (the latest year for which complete data are available) was 1,806 walruses, much lower than in 1999 or 2000. Preliminary data from the marking, tagging, and reporting program in 2002 include 1,475 walruses as of the end of the year. This suggests that the 2002 catch level will be similar to the number taken in 2001 when 1,404 tusks were tagged.

Walrus Harvest in Russia

The Fishery Department in the Russian Federation's Agricultural Ministry is the agency responsible for managing walruses in Russia. Since 1992 only Native people have been allowed to harvest walruses in Russia. Current harvest limits set by the Fishery Department are 3,000 walruses annually. Due to severe economic constraints, Russia suspended its walrus harvest monitoring and research programs in 1998. Recognizing the need for estimates of the Russian subsistence harvest, in 1999 the Alaska Eskimo Walrus Commission and the Fish and Wildlife Service secured funding from various sources, including the North Slope Borough and the National Park Service, to train and support Native villagers from the Chukotka region in Russia in the collection of walrus harvest data. That support continued through 2002. Harvest monitors reported a Russian catch of 1,332 walruses in 2001.

In its 28 December 2001 letter to the Fish and Wildlife Service, the Marine Mammal Commission commended the Service and the Alaska Eskimo Walrus Commission for their cooperative and effective efforts to estimate harvest levels in Alaska. The letter also recommended that the Service advise the Native hunters of the uncertain status of the Pacific walrus population and the potential risk of overexploitation, and that it would be unwise to increase the number of walruses taken for subsistence purposes, given the current uncertainties. In its 20 March 2002 response, the Service agreed with the Commission's concerns and outlined ways that it planned to work with the Alaska Eskimo Walrus Commission to communicate with Native hunters and communities. Identified methods included annual visits to walrus-harvesting villages, presentations at meetings of the Alaska Eskimo Walrus Commission, and preparation and distribution of a bulletin to walrus hunters.

Research

Section 117 of the Marine Mammal Protection Act requires that the Secretaries of Commerce and the Interior prepare and periodically update stock assessment reports for each marine mammal population in U.S. waters. Those reports are used to help manage interactions between marine mammals and commercial fisheries and must take into account all sources of human-related mortality. The reports must include estimates of each population's size and a potential biological removal (PBR) level. The latter is calculated using a formula designed to estimate how many animals can be removed annually from the marine mammal stock (not including natural mortality) while maintaining a high degree of assurance that the stock will remain at or increase toward its optimum sustainable population level. Variables include the best estimate of minimum population size. In 2002 the Service completed a new stock assessment report for the Pacific walrus population. Because of the lack of recent survey data, the assessment did not include a population estimate or an estimate of PBR. As a result, it is not possible to determine if subsistence harvests are sustainable.

A rangewide walrus population survey has not been done since 1990, partly because surveys produced abundance estimates with very wide confidence intervals. Factors limiting the precision of rangewide aerial surveys are the vast and remote areas to be covered; frequent fog and bad weather; the patchy, unpredictable distribution of walruses; uncertainty as to the proportion of walruses in the water and not visible to observers at the time of a survey; and difficulty in counting animals that are visible only briefly from passing survey planes and that tend to haul out in large, tightly packed groups.

In 2000 the Fish and Wildlife Service and U.S. Geological Survey held a workshop to evaluate methods for determining the abundance and status of Pacific walruses. Participants recommended a series of studies to develop or improve survey methods: (1) develop and test techniques to use satellite telemetry to develop a correction factor for the proportion of walruses at sea during the time of the survey; (2) investigate new remote sensing technologies (i.e., using satellite imaging and thermal sensors) to count animals on land and to assess haul-out distribution patterns on sea ice; (3) assess mark-recapture methods as an alterna-

tive to rangewide aerial surveys; (4) reexamine past survey designs for insights into optimal time and amount of survey effort required; and (5) test video systems to verify and document observer counts during aerial surveys.

After reviewing research in each of these areas at its October 2001 annual meeting, the Marine Mammal Commission wrote to the Fish and Wildlife Service in December 2001, recommending that it design, schedule, and complete a new rangewide walrus population survey by 2005 or sooner if prospects for effective new techniques prove promising. The Commission also recommended that, as soon as a new survey is scheduled, the Service produce a draft survey design and sampling protocol and convene a meeting with representatives of the U.S. Geological Survey, the Alaska Eskimo Walrus Commission, Russian scientists, the Alaska Department of Fish and Game, the Marine Mammal Commission, and other interested parties to review the survey design. In its 20 March 2002 response to the Commission, the Service agreed that 2005 was a reasonable target for conducting a new walrus survey and that it would develop a timeline and survey design for review by all parties. Based on promising results from remote sensing studies (see below), the Service is optimistic about developing a survey design by the end of 2003.

Satellite Telemetry—One of the highest-priority recommendations by participants at the 2000 workshop was for satellite telemetry studies to develop more accurate correction factors for survey counts. One of the problems with previous population estimates has been a lack of information on the amount of time that walruses spend in the water and thus are unseen by survey teams. Satellite tagging was identified as a way to determine the proportion of time walruses spend in the water versus time spent hauled out on ice. Because Pacific walruses live in the pack ice far from shore for much of the year, they are often difficult to access. In addition, they are large animals that are difficult to sedate and dangerous to handle. Thus, safe, reliable techniques for applying satellite tags to walruses are not yet available. The U.S. Geological Survey embarked on a project in 2002, partially funded by the Marine Mammal Commission (see Chapter VIII), to develop remote tagging

capability so that a large number of animals can be tagged without having to be captured.

Remote Sensing—Participants at the 2000 workshop also recommended investigating the use of remote sensing to help in the population assessment. The original goal was to use remote sensing to identify walrus distribution at the time of the survey to help stratify aerial survey effort. However, results of studies in 2001 at Bristol Bay showed that counts derived from IKONOS satellite imagery corresponded closely to actual counts made that same day, indicating that this technique may be useful in deriving abundance estimates. In addition, thermal imaging has shown promise in accurately estimating walrus abundance in real time. Therefore, in 2002 the Fish and Wildlife Service continued efforts to explore the possibility of using remote sensing and thermal imagery to aid in estimation of abundance.

Biomonitoring—In its December 2001 letter to the Service, the Marine Mammal Commission recommended that the Service and the Alaska Eskimo Walrus Commission organize and implement an expanded long-term program to annually collect and archive a representative sample of walrus tissues from animals harvested at the various hunting villages in Alaska and, as possible, Russia. The Commission believed that the subsistence harvest offered an underutilized opportunity to collect biological samples for several areas of research, including age-specific reproduction, prey selection, contaminant levels, and other life history parameters. A sample series extending across a time span of decades could offer valuable insights into the population's status and causes of population trends that would not be possible otherwise. In its 20 March 2002 response, the Service advised that it anticipated receiving funding under a co-management initiative under the Marine Mammal Protection Act to identify sample collection priorities. As a related matter, the Service noted that results from samples obtained from past subsistence harvests had shown that contaminant concentrations were considerably lower than values reported for Atlantic walrus and populations of other arctic pinnipeds. In 2002 the Service received \$1.27 million to support work under cooperative agreements. Approximately one-third of that amount went to the Alaska Eskimo Walrus Commission, which

planned to use part of those funds to convene a workshop in 2003 to formulate a detailed research plan, including a harvest biomonitoring program.

Co-Management Activities

Section 119 of the Marine Mammal Protection Act allows for the Fish and Wildlife Service to enter into cooperative agreements with Alaska Native organizations to conserve marine mammals and manage subsistence harvests. In 1997 the Fish and Wildlife Service entered into such an agreement with the Alaska Eskimo Walrus Commission to formalize and strengthen joint walrus conservation efforts. In 2002 the Service disbursed approximately \$400,000 to the walrus commission to support its annual meeting, harvest monitoring programs, and a youth internship program.

International Cooperation

Recognizing mutual interests in conserving marine mammal populations that range across the U.S.–Russian border, the Fish and Wildlife Service initiated steps after the breakup of the former Soviet Union to formalize cooperative arrangements for research and management activities on Pacific walruses, as well as polar bears. A protocol expressing mutual interests in negotiating a bilateral agreement on polar bears was signed in 1992 and a similar agreement was signed on Pacific walruses in 1994.

U.S. and Russian officials agreed to complete negotiations on the polar bear agreement before proceeding to negotiate the walrus agreement. The polar bear agreement was signed in October 2000 and sent to the Senate on 15 July 2002 where it awaits ratification. No steps were taken in 2002 to advance a similar agreement with respect to the Pacific walrus. As noted, however, the Service and members of the Alaska Native community continue to cooperate on efforts to monitor walrus harvests in both the United States and Russia and to carry out various walrus research initiatives.